

REMARKS

Claims 1-12 are pending in the application. Claims 1, 7, 9 were objected to due to informalities. Claims 1-5, 8, 9, 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by Nakamoto et al. (U.S. Patent No. 5,936,810). Claims 6, 7, 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto et al. in view of Lin et al. (U.S. Patent No. 6,175,477) (hereinafter, “Lin I”). Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto et al. in view of Lin et al. (U.S. Patent No. 6,185,078) (hereinafter, “Lin II”). Applicant respectfully traverses the rejections and objections and requests the Examiner to withdraw the pending rejections and objections in light of the following remarks.

A. Objected Claims – Claims 1, 7, 9

Claims 1, 7, 9 were objected to because they included some informalities. In particular, the Office Action asserts that in claim 1, line 9, “the track” should be changed to “a track”; that in claim 7, line 2, the dependency should be changed from “6” to --1--; and that in claim 9, line 2, the dependency should be changed from “1” to --8-- for antecedent purposes. Applicant has amended claims 1 and 9 as requested in the Office Action. Because claim 7 has been almost identical to claim 6, Applicant has amended claim 7 to define “one of two ferromagnetic layers is thicker than the other ferromagnetic layer.” Claim 7 is supported by the original disclosure. See page 38, lines 8-10, page 39, lines 2-10 and page 40, lines 1-3.

Based on the above, claims 1, 7, 9 are allowable as amended. Applicant respectfully requests the Examiner to withdraw the objections to claims 1, 7, 9.

B. 35 U.S.C. § 102(b)

Claims 1-5, 8, 9, 12 are patentable under 35 U.S.C. § 102(b) because Nakamoto et al. does not anticipate or disclose lead connection portions positioned in notch portions at both ends

of the laminate in the track width direction and where the pair of lead layers are connected to the laminate.

Claims 1-5, 8, 9, 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by Nakamoto et al. The Office Action asserts that Nakamoto et al. discloses all limitations of claims 1-5, 8, 9, 12. Claim 1 has been amended to include the limitation, “the laminate has a pair of notch portions formed on the side apart from the substrate, and the pair of lead connecting portions are positioned in the notch portions at both ends of the laminate in the track width direction.” Applicant submits that claims 1-5, 8, 9, 12 overcome the rejection.

Claim 1 recites a spin valve thin film magnetic element comprising a pair of nonmagnetic conductive layers, a pair of pinned magnetic layers, and a pair of antiferromagnetic layers, which are laminated in turn on both sides of a free magnetic layer in a thickness direction to form a laminate on a substrate. The spin valve thin film magnetic element defined in claim 1 further comprises a pair of bias layers and a pair of lead layers.

At least the antiferromagnetic layer apart from the substrate is made narrower than the free magnetic layer in a track width direction to form lead connecting portions of the laminate on both sides of the narrow antiferromagnetic layer in the track width direction. The pair of lead layers are extended from both sides of the laminate in the track width direction to the center of the laminate and connected to the laminate through the pair of lead connecting portions. The laminate has a pair of notch portions formed on the side apart from a substrate, and the pair of lead connecting portions are positioned in the notch portions at both ends of the laminate in the track width direction.

In claim 1, a sensing current flows from the lead layers to the laminate without passing through the antiferromagnetic layer. Component of shunt current through the bias layers is

significantly reduced and as a result, no side reading problem occurs. In addition, the lead layers are respectively fitted into the notch portions for connection. This decreases steps between the laminate and the lead layers, thereby resulting in decrease in the gap of the spin valve thin film magnetic element. When an insulating layer is further laminated on the spin valve thin film magnetic element, the possibility of producing pin holes or the like in the insulating layer can be prevented and insulating performance can be improved.

On the other hand, Nakamoto et al. discloses a magnetoresistive effect head, which comprises a first ferromagnetic film 18 as a free layer, second ferromagnetic films 22, 24, third ferromagnetic films 36, 38, non-magnetic conductive layers 20, 34 and anti-ferromagnetic films 16, 40 to form a laminated film 10, as shown in Figure 3. Nakamoto et al. does not disclose lead connecting portions on both sides of the narrow antiferromagnetic layer in the track width direction and positioned in the notch portions. Nor does Nakamoto et al. disclose that the pair of lead layers are connected to the laminate through the pair of lead connecting portions.

In Nakamoto et al., portions of electrodes 14 are stacked on the antiferromagnetic film 40 and connected to the laminated film 10 through a magnetic domain control layer 12. The sensing current inevitably flows through antiferromagnetic layer 40. The antiferromagnetic layer 40 has the high resistivity, so significant amount of shunt current through the magnetic domain control layer 12 flows to the laminated film 10. This causes side reading problem. In addition, because Nakamoto et al. does not have the notch portions where the lead layers are fitted, it does not have the effect of preventing the pin holes and improving the insulating performance.

For at least these reasons, Nakamoto et al. does not anticipate or disclose the spin valve thin film magnetic element, as defined in claim 1. Thus, pending claims 1-5, 8, 9, 12 are

patentable over Nakamoto et al. Applicant respectfully requests the Examiner to withdraw the rejections to claims 1-5, 8, 9, 12.

C. 35 U.S.C. § 103(a)

1. Claims 6, 7, 11

Claims 6, 7, 11 are patentable because the prior arts do not teach or suggest lead connection portions positioned in notch portions at both ends of the laminate in the track width direction and where the pair of lead layers are connected to the laminate.

Claims 6, 7, 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto et al. in view of Lin I. The Office Action concedes that Nakamoto et al. does not disclose that the pinned magnetic layer comprises a laminate of three layers and that the antiferromagnetic layer comprises any one of XMn alloys and PtX'Mn alloys. However, the Office Action asserts that Lin I discloses a pinned magnetic layer 920 comprising a laminate of at least two ferromagnetic layers 922/924 and a nonmagnetic intermediate layer 926 inserted therebetween and that the antiferromagnetic layer is made of PtMn. Thus, the Office Action asserts that it would have been obvious to one of the ordinary skill in the art to replace the pinned layers and the antiferromagnetic layer of Nakamoto et al. with those disclosed in Lin I.

Applicant respectfully disagrees.

Claims 6, 7, 11 are dependent claims of claim 1 and each claim recites a spin valve thin film magnetic element having the lead connecting portions. As discussed in Section B above, Nakamoto et al. does not disclose the lead connecting portions defined in claim 1. Nor does Lin I disclose such lead connecting portions. Thus, even if Nakamoto et al. is modified with the layers of Lin I, such combination does not teach or suggest the spin valve thin film magnetic element having the lead connecting portions, as defined in claims 6, 7, 11.

Other than Applicant's disclosure, there is no motivation or suggestion to modify the pinned layers and the antiferromagnetic layers of Nakamoto et al. with the layers of Lin I. Regarding the second ferromagnetic films 22, 24 and the third ferromagnetic films 36, 38, Nakamoto et al. simply discloses that two films 22, 24 or 36, 38 form stacked layers and have the fixed magnetization direction. See column 8, lines 26-59. Regarding the antiferromagnetic layer 16, 40, Nakamoto et al. discloses that FeMn, NiMn and CrMn may be used. See column 8, lines 50-53. Nowhere in Nakamoto et al. teaches or suggests that the second and third ferromagnetic films 22, 24, 36, 38 can be replaced with the pinned layer disclosed in Lin I. In addition, Nakamoto explicitly teaches away from use of PtMn for the antiferromagnetic layer.

Lin I discloses a spin valve sensor that cap layer 905 and seed layer 440 are added to improve its thermal stability. There is no suggestion in Lin I that its pinned layer 920 and the antiferromagnetic layer can be used in the head disclosed in Nakamoto et al. Applicant respectfully submits that “[t]he teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.” In re Vaeck, 947 F.2d 488 (Fed. Cir. 1991); MPEP § 2142 at 2100-124.

Based on the foregoing, the rejections to claims 6, 7, 11 are improper and should be withdrawn.

2. Claim 10

Claim 10 is patentable under 35 U.S.C. § 103(a) because the prior arts do not teach or describe lead connection portions positioned in notch portions at both ends of the laminate in the track width direction and where the pair of lead layers are connected to the laminate.

Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakamoto et al. in view of Lin II. The Office Action concedes that Nakamoto et al. does not disclose

intermediate layers between the bias layers and the lead layers. However, the Office Action asserts that Lin II discloses such intermediate layer and it would have been obvious to the person having the ordinary skill to place the Ta layer disclosed in Lin II between the bias layers and the lead layers of Nakamoto et al.

Claim 10 is a dependent claim of claim 1 and claim 10 recites a spin valve thin film magnetic element having the lead connecting portions. As discussed in Section B above, Nakamoto et al. does not disclose the lead connecting portions defined in claim 1. Nor does Lin II disclose such lead connecting portions. Even if Nakamoto et al. is modified with the nonmagnetic seed layer 252 of Lin II, such combination does not teach or suggest the spin valve thin film magnetic element, as defined in claim 10.

Other than Applicant's disclosure, there is no motivation or suggestion to add the intermediate layer to the laminated film 10 of Nakamoto et al. Nakamoto et al. does not teach or suggest any intermediate layer. Furthermore, Nakamoto et al. implicitly teaches away from addition of the intermediate layer by showing that electrodes 14 are directly stacked on the magnetic domain control layer 12. See column 7, lines 53-54 and Figure 3.

In this regard, the Office Action assert that use of Ta in the longitudinal biasing/lead sections of spin valve heads is well known in the art. Even if use of Ta is well known in the field of the spin valve head, that does not motivate or suggest addition of the intermediate layer to Nakamoto et al. That use of Ta is well known in the field of the spin valve head does not mean that the intermediate layer is necessary for or expected to successfully work with the specific arrangement of layers disclosed in Nakamoto et al. Neither Nakamoto et al. nor Lin II provides such suggestion. Thus, other than claim 10, there is no motivation, to add the intermediate layer disclosed in Lin II to the laminated film 10 of Nakamoto et al.

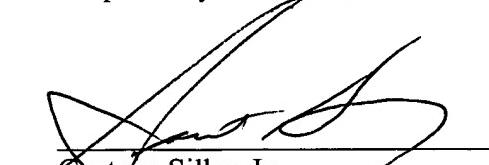
Based on the above, the rejection to claim 10 is improper and should be withdrawn.

For the foregoing reasons, claims 6, 7, 11 are not obvious over Nakamoto et al. in view of Lin I, and claim 10 is not obvious over Nakamoto et al. in view of Lin II, either alone or in combination. Applicant respectfully requests the Examiner to withdraw the rejections to claims 6, 7, 10, 11.

CONCLUSION

In view of the arguments above, pending claims 1-12 are patentable. Applicant respectfully requests the Examiner to grant early allowance of this application. If for any reason, the Examiner is unable to allow the application in the next Office Action and believes that an interview would be helpful to resolve any remaining issues, he is respectfully requested to contact the undersigned attorneys at (312) 321-4200.

Respectfully submitted,



Gustavo Siller, Jr.
Registration No. 32,305
Attorney for Applicant

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200